in a constant condition.[15] The joint consequence of different internal mechanisms each operating to maintain a given feature of the internal environment is that each mechanism enjoys a stable environment in which to operate. Hence, each is buffered from conditions outside the organism – as external conditions begin to change conditions inside the organism, the appropriate mechanism registers the change in the internal environment and acts to restore it to its normal condition. Because of this internal buffering, the various other mechanisms, and the organism as a whole, do not show regular causal responses to perturbations in the external environment and so are indeterministic in the manner Bichat noted. Moreover, insofar as each component mechanism is successful in performing its activity as needed to keep the internal environment constant, the organism continues to maintain itself in the face of conditions that would seem to have the potential for destroying it. Thus, he can explain why organisms seem to resist external factors that would seem deadly to them.

Bernard's account leaves some important features of biological mechanisms unexplained. Perhaps the most important feature left unexplained is *how* it is that component mechanisms maintain "the constancy of the internal environment" (Bernard, 1878a, p. 113). In order to do this, though, each component mechanism must itself have a complex structure, including components that serve to detect when the operation is needed and a means to activate the mechanism so that the operation is performed when and only when it is needed. Walter Cannon (1929) introduced the term *homeostasis* (from the Greek words for *same* and *state*) for the capacity of living systems to maintain a relatively constant internal environment. He also sketched a taxonomy of strategies through which animals are capable of maintaining homeostasis. The simplest involve storing surplus supplies in time of plenty, either by simple accumulation in selected tissues (e.g., water in muscle or skin), or by conversion to a different form (e.g., glucose into glycogen) from which reconversion in time of need is possible. Cannon noted that in most cases such conversions are under neural control. A second kind of homeostasis involves altering the rate of continuous processes (e.g., changing the rate of blood flow by modifying the size of peripheral blood vesicles to maintain uniform temperature).

Cannon's particular interest was the role of the autonomic nervous system in regulating supplies or processes, but during the same period biochemists

[15] Bernard, for example, says, "all the vital mechanisms, however varied they may be, have only one object, that of preserving constant the conditions of life in the internal environment" (1878a, p. 121, translated in Cannon, 1929, p. 400).